GAS JOURNAL, APRIL 15, 1942

VOL. 238 94th YEAR No. 4117

EDITORIAL NOTES

BRAINS TRUST ON COKE

WE have published practically in full in the "JOURNAL" the Paper on the Future of Coke which Mr. J. G. Bennett, Director of the British Coal Utilization Research Association, gave at an important meeting in Sheffield attended by members of several fuel organizations, including The Institution of Gas Engineers. We commented editorially on the Paper, which was provocative and raised broad issues, in the "JOURNAL" of Feb. 25. We return to the subject again in view of the discussion to which the Paper gave rise. It was a long discussion and a forthright one, partly oral and partly written, in which opinions were ventilated freely. The occasion may, we think, be aptly described as a brains trust on coke. From the numerous arguments advanced we have sorted out a few which seem to us to picture the trends of thought running through the meeting. For our part, and having studied these arguments (put forward, by the way, by experienced protagonists), we find reinforcement of our opinion, previously expressed, that in the present and for the near future gas and coke should be regarded as complementary fuels, and that to aid in the greater use of gas in the immediate post-war years the reasonable and balanced course is to pay more attention to the preparation, marketing, and utilization of coke. We do not hesitate to reiterate this view, because we feel that it is fundamental to the best use of coal and to the progress of the carbonizing industries.

It may have come as a surprise to many that Mr. Bennett should in the course of his Paper have tackled with evident relish and certainly with assurance problems definitely falling within the ambit of the carbonizing industries and especially of the Gas Industry—problems about which those intimately concerned have argued much. To our mind, however, it is both refreshing and useful to have these clear-cut views of an onlooker—we use the term in no disparaging way—of the Gas Industry, whose work lies in research on solid fuels. Mr. Bennett's observations on complete gasification evidence his boldness of approach. We referred to his contentions in this regard in our issue of Feb. 25, when we suggested that they constituted something of a challenge. They can be simply stated: Assuming that complete gasification is not regarded as unsound from the point of view of the national policy of coal conservation, can it be justified by the production of cheaper gas? Mr. Bennett roundly asserted that at present there is no indication of this, and that economies following the introduction of complete gasification must be found outside the retort house. "Complete gasification," he said, "can be looked on as a potential provider of a *cheaper* therm than could be provided by normal carbonization only if coke has to be sold at prices considerably lower than those ruling at present. The *cheaper* therm will, however, he more expensive than the therm produced under present relative coke and gas prices." Which, it will be agreed, is a somewhat sweeping statement.

The Acting Director of the Gas Research Board, Dr. W. T. K. Braunholtz, confessing surprise at the statement, suggested that Mr. Bennett might have experienced difficulty in preventing his artistic imagination from controlling his scientific pen. Dr. Braunholtz then proceeded to what he described as a true picture. It was absurd, he said, to speak of a Gas Research Board process and a Gas Research Board gas, as Mr. Bennett had spoken, and that it was meaningless at this stage to attempt to place a figure on the efficiency of this "supposed process." The striking feature of the Lurgi process of complete gasification under pressure, he continued, is the smallness, simplicity, and cleanliness of the plant and the small number of personnel required to operate it; and he thought there was no doubt that any extra capital cost of the plant due to operating above atmospheric pressure, or to other reasons, would be more than offset by its large gas-making capacity and by low labour costs. The German view, he added, was this: After the war the Gas Industry will be called upon to supply greatly increased quantities of gas for various purposes, and additional quantities of gas may not be obtainable by the usual process of high-temperature carbonization since the requisite types of coal will not be available in unlimited quantities. The Industry must therefore look around for alternative methods and starting materials for producing cheaply these increased quantities of gas.

In any case, concluded Dr. Braunholtz, the term complete gasification is not accurate in the strictest sense. It is confidently expected that the process will permit of the recovery of considerable yields of good quality oil. Also—and we think this should be noted—the aim of the present investigators is to devise a process sufficiently flexible to enable coke of a reactive type to be produced in greater or less amount to meet the fluctuating market. As to cost, "the investigations of the Gas Research Board have not yet reached the stage at which any reliable estimate can be made of the cost of gas made by complete gasification. Years of intensive investigation are still required before the picture can take tangible shape."

This, it would seem, is the answer to a statement made last September—that schemes for the complete gasification of coke were ready for the commercial-scale trial stage—which baffled us and caused us to suggest at the time (Sept. 17, 1941) that it might well receive elucidation and amplification from the Gas Research Board. Mr. Bennett expressed a sense of disappointment at the foregoing answer, however, which, he gave his hearers to understand, had shattered none of his convictions. The carbonization process, he emphasized at the Sheffield meeting, is wonderfully efficient thermally, the while expressing the view that it will not be in the country's interest to supplant it by "a process of notably lower thermal efficiency unless we are forced to it by lack of coals which can be carbonized. The position remains that we can still look to the production of coke as an essential part of the Gas Industry's functions." We believe this to be true, but we have always supported continuation of the research on complete gasification, and we feel no impatience whatever at the results already achieved—the reverse, in fact, for research is not a mechanical process and the amount of manpower devoted to it by the Gas Industry is infinitesimal. To gain a sense of proportion regarding Gas Industry research, let us take the single instance of the development of nylon, which is now an accepted product. One company (the Du Pont Company) was willing to work ten years on the subject. A team of 230 chemists and engineers was engaged in research and development before success was achieved in bringing this new product into production. We should not feel in the very least discouraged to learn from the Acting Director of the Gas Research Board that years of intensive investigation are still required before the complete gasification picture can take tangible shape.

On the other hand, the present is with us, and what are we going to do about coke?

MIXED BAG OF OPINION

As we have said, opinions on the virtues or otherwise of coke were ventilated freely at the Sheffield meeting, and many acres of ground were covered. We have already dealt with Mr. Bennett's lack of faith in the immediate prospects of complete gasification. Let us turn to a few of his observations, and the observations of others at the meeting, about coke. We gather that, in his opinion, it would be folly to attempt to replace the domestic coal fire, because it "is valued for its merits," and, again, that it is only wishful thinking to suppose that ordinary gas coke is or can be an effective substitute for coal for the purpose. We should add without delay that Mr. Bennett holds out great possibilities for alkali-activated cokes. For our part we dislike the expression "ordinary coke," for "ordinary coke" is vague and undoubtedly covers a multitude of sins as well as a multitude of products. "Ordinary coke" certainly came in for criticism at the meeting. In practical rather than imaginative vein one of the speakers declared that the decision regarding the use of coke rests in the hands of the housewife, who knows that she will have to carry more coke scuttles than coal scuttles, does not like the appearance of the coke fire, and in many cases has only limited fuel storage capacity. He declared without ado that the present commercial grades of coke will not displace the "inefficient, smoky, but cheerful coal fire." Regarding these and similar arguments the comments of Mr. W. L. Boon appeal to us. Summed-up, they were: Whatever the improvements in the open coal grate, the use of raw coal in the open fire is criminal waste. The coal industry has never looked with favour on the development of the open coke fire, and yet the measure of success has been limited only by inadequacy of supplies of suitable coke. Pre-war, with practically no publicity, new coke grates were being installed in the area of the London and Home Counties at the rate of 130,000 per annum—and this figure could easily have been multiplied threefold. The change-over from coal to coke could be very rapid.

Mr. Bennett, who, as a sort of aside, said how impressed he had been that all his friends in the Gas Industry burned coal in their sitting-room grates, asserted that the good of the coal industry is in no way opposed to the progress of the carbonizing industries, and that in research and technical development lies a common meeting ground. Regarding the matter historically, Mr. Boon could express no confidence in this talk about common interest and co-operation between the coal industry and the carbonizing industries. In his view, effective co-operation will be brought about only by Government policy or legislation. There was agreement, however, as to the possibilities of coke being very bright indeed, granted certain premises in regard to quality—a characteristic bound up, of course, with the supply of suitable coals. Among these possibilities the use of coke in steam wagons and mobile producers for road transport came in for comment and Mr. Bennett, who urged that technical development should be pursued in two parallel directions—the production of highly reactive coke and cokes suitable for very high temperatures, both of which ought to command a high price—pointed to the immense field before coke for the heating of buildings, for district heating making use of waste heat from electric generating stations has in his opinion only very restricted possibilities. It was contended by one speaker that for central heating coke oven coke is suitable, and that if this coke enters into real competition in this market the result may be to cause a gradual change-over in the Gas Industry from continuous vertical retorts to intermittent verticals and horizontal chamber ovens rather than to a change to complete gasification, while the need for uniform coke prices throughout the country was stressed. We think it will be agreed that the discussion provided an answer to the question put by the Author at the start of his Paper—"Has coke a future or only a past?"

Personal

Mr. E. L. Farquhar, Manager of Kelloway and Largo Gas-Works since 1923, has received a managerial appointment with the United Kingdom Gas Corporation, and will take charge of the Undertaking at South Elmsall, near Doncaster. A former president of the Scottish Junior Gas Association, Mr. Farquhar is Chairman of the Commercial Section of the North British Association of Gas Managers and Engineers.

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Mr. J. H. Canning, Jun., Engineer and Manager to the Melton Mowbray Gas-Light and Coke Company, Ltd., has been appointed Engineer to the Uppingham Gas Light & Coke Company, Ltd., *vice* Mr. G. Stevenson, of Long Eaton Gas Company. The change has been made in pursuance of a policy of centralization and the Uppingham Company will be operated from Melton Mowbray.

* * *

Mr. W. E. Plevin, B.Sc., Engineer and General Manager of the New Mills Gas Department, has been appointed Engineer and Manager at Oldbury in the place of Mr. J. Poulson.

Obituary

S. G. Wood

It will be with great regret that his friends in the Gas Industry will have learnt of the death of Mr. S. G. Wood. He was Deputy-Chairman of the Severn Valley Gas Corporation, Ltd., and of Gas Consolidation, Ltd., Chairman of the Cheltenham Gas Company, and Chairman or Director of all the constituent Companies of the Group. He died on April 2, after a two months' illness, at the age of 63.

He had many friends in the Gas Industry, and had been personally responsible for carrying through a large proportion of the negotiations in connexion with the formation of the Group.

Mr. Wood joined the Board of the Cheltenham Gas Company in 1924, becoming Chairman in 1928, since which time he devoted a large part of his time to the Gas Industry. He negotiated the purchase of the Tewkesbury, Winchcombe, Broadway, and Pershore Gas Companies in 1929 and then set about supplying these works with gas in bulk from Cheltenham. By 1941 the sales in these areas showed an increase of 385%.

He leaves a widow, two sons, and a daughter.

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James Taylor

It is with great regret that we have to report the sudden death on April 9 of Mr. James Taylor, of Weston-super-Mare and District Gas Company. Mr. Taylor, who was 65 years old, was appointed Chief Engineer to the Company in 1915, and in 1940 he was appointed Managing Director also. He began his career in the Gas Industry with the Oldham Corporation, where he became Technical Assistant and Works Manager. In 1908 he was appointed Engineer and Manager to Mossley Corporation, remaining there until his move to Weston-super-Mare. He had been a member of The Institution of Gas Engineers since 1910, taking a great interest in the Benevolent Fund, of which he was a member of the Committee of Management. He was an enthusiastic member of the Southern Association of Gas Engineers and Managers and a regular attendant at its meetings.

* * *

On March 28 the death took place of Alderman Isaac Whitsed. Mr. Whitsed had been a Director of the Peterborough Gas Company for the past twenty years and had occupied the office of Vice-Chairman during the past six years. He was presented with the honorary freedom of the city in recognition of his long and valuable public work.

* * *

After a short illness, Mr. Arthur C. Carter, F.I.C., died on March 30. Mr. Carter was serving on the Royal Commission on Sewage Disposal when he was appointed an Inspector under the Alkali Act in March, 1914. After some years at Swansea under the late Dr. Fryer he was transferred to the Birmingham and Midlands District.

* * *

We are sorry to announce the death, at the age of 26, of Sergeant Maurice Hutchinson, R.A.F., V.R., son of Mr. E. Hutchinson, of Worksop. Sergeant Hutchinson, who was killed while on Active Service, was a wireless operator and air gunner.

* * *

The death has occurred of Mr. A. T. Head, who had been the London Representative of the Nico Light Company, Ltd. (formerly New Inverted Incandescent Gas Lamp Company, Ltd.), from 1905 till 1937. Prior to 1905 he was with the Maidstone Gas Company, and the Welsbach Light Company, Ltd. During these years he became well known in the Gas Industry, for he originally introduced the inverted gas burner in London and the Home Counties. Mr. Head was 68 years of age and leaves a widow, two daughters, and six sons (five of whom are serving with H.M. Forces).

NORTH BRITISH ASSOCIATION OF GAS MANAGERS

Presidential Address*

of

RONALD D. KEILLOR,

Greenock

[Abstract]

AFTER the war the more extensive use of town gas and prepared smokeless fuels commonly produced by the carbonizing industries will play a major part in the improvement of living and working conditions. For too long has the smoke abatement movement been looked upon as a lofty ideal to be referred to periodically by doctors and other scientific workers but receiving little or no enthusiastic attention from the general public, who stand to gain most in the preservation of health and property which would be the dividend of a definite forward policy designed to eliminate sources of atmospheric pollution.

The swing of politics should not cause deviation from forward policies dealing with social welfare, technical developments, or economic changes which are calculated by competent authorities to be ultimately in the best interests of mankind generally. The facts are available to prove that the burning of raw coal in domestic grates and industrial furnaces causes colossal damage to human life, vegetation and property, in addition to causing shameful wastage of one of our greatest natural resources. When a definite forward policy is drawn up to deal with this problem there is no doubt that the use of gaseous and smokeless solid fuels produced by the carbonizing industries will be given primary consideration.

Various solutions have been found to the problem of limiting the incidence of the cost of new systems of heating; for example, by the introduction of district heating and the older established practice of loaning, hiring, or hire-purchasing the necessary gas or coke burning apparatus to the user in accordance with the current policy of the local authority or gas company concerned. Houses in state-aided schemes, on the other hand, are usually provided with heating and cooking facilities as broadly directed by the Board of Health; the final selection and arrangement is meantime left to the local authority concerned.

Fuel experts are now attempting to interest architects and builders in improved methods of accommodating supplies of solid fuel in flats to facilitate bulk deliveries in "loose" loads with a view to offsetting the higher cost of prepared fuels. Arrangements for the disposal of ashes in such properties could also be greatly improved. If the people who carry fuel and ash buckets up and down interminable stairs only realized that better building design could eliminate these jobs they would soon influence building practice in this direction by the eloquence of their plea for improvements in fuel and ash handling arrangements.

Fuel burning equipment suitable for the use of prepared fuels, improved arrangements for handling and storage of fuel and ashes, and the proper thermal insulation of hot water installations are vitally important aspects of our national daily life. Therefore their provision should be approached from a more scientific angle; definite policies should be adopted, otherwise progress toward the ideal of smokeless cities with maximum conservation of coal will continue to be extremely slow and haphazard. Coal is becoming increasingly hard to win in this country, and the position is such that some authorities go so far as to recommend the setting up of a Ministry of Fuel.

Whether a Ministry of Fuel is set up or not the Government will require to face up to the question of establishing a broad national fuel policy; this island country of ours need not be so dependent upon imported fuel as it has been in the past, and our coal carbonizing and hydrogenation industries must be given more definite encouragement with this end in view.

Gas Undertakings and National Service

Unfortunately many gas undertakings suffered serious depletion of key personnel and semi-skilled labour prior to the introduction of the Essential Works Order; the principal reasons were calling-up of Territorials, return of tradesmen to former occupations ruled to be of greater national importance, and the drift of labour to more lucrative situations created by emergency conditions. This depletion of skilled and semi-skilled personnel has naturally thrown extra responsibility upon attenuated administrative staffs and upon the remaining regular employees and has militated against the maintenance of high operating efficiency. However, in the face of this difficulty together with supply difficulties, stand-bys, blitzes, and overnight alterations in outputs, as undertakings have, generally speaking, "carried on" with exceptional fortitude and success.

I have been glad to assist in the promotion of the Mutual Aid scheme which the Scottish Gas Industry was quick to adopt, and I warmly appreciate the helpfulness of my colleagues in this connexion.

As in the last war, women have again come to the assistance of the Greenock Gas Undertaking, and have aided us to release men from the gas-works and gas service sections for the Forces and for work considered to be of greater national importance. It is to be hoped that any further withdrawals of labour from gas undertakings will only be insisted upon after very careful consideration of the effect of lowered gas-works operating efficiency and the possible retardation of recovery following enemy damage.

New Gas Service Premises

The substantial increase in gas sales achieved locally in recent years was naturally accompanied by increased demands upon existing facilities for the storage and renovation of gas appliances. I first reported upon the necessity for an extension of existing facilities for the renovation of free loan gas cookers and hotplates and the storage of appliances and material in 1937; a site adjoining existing premises in Dalrymple Street was then earmarked for this purpose. An adjacent condemned tenement property, between the Showrooms in West Blackhall Street and the site referred to, was also purchased and the property demolished in order to provide an adequate area of ground for the projected extensions. Tenders for the various sections of the work were ultimately placed in 1938.

War conditions naturally impeded progress with the new building and made the change-over period more difficult than had been anticipated; however, thanks to the co-operation between the Contractors and the Gas Department staff only a few details remained to be brought to completion by the end of 1940.

A special new Stores Record and Job Costing system had been previously designed in collaboration with the Town Chamberlain's Central Audit Department, and was introduced with the inauguration of the New Stores at the start of the financial year commencing May 16, 1940.

The area covered by the new Gas Service Department premises is 1,200 square yards, and embraces a portion of ground lying between the rear of the existing showroom and the existing Service Department Workshops and Stores at 203, Dalrymple Street.

The new premises were designed to provide improved office, stores, workshop and staff accommodation and to include a modern demonstration room; the extension and modernization of the existing showroom was also part of the scheme.

The main building is a steel framed structure with a slated and glazed roof in 5 bays each 20 ft. 8 in. wide and from 70 ft. to 100 ft. long in accordance with the shape of the site. This portion of the building is in one story with a minimum of 12 ft. of headroom under the roof joists. Ventilation is effected by means of 9 in. ridge ventilators and heating is by gas-fired overhead radiant bowl and wedge heaters; gas lighting is standardized throughout.

Another section of the premises covering some 265 square yards forms a two-story brick building with demonstration room on the upper floor. This room is 40 ft. by 30 ft. and is principally for cookery demonstrations; a platform 16 ft. wide by 9 ft. deep is provided at one end. The outward appearance is neat but not imposing, with a slate roof and a roughcast exterior.

The west bay of the main single story building is the office section, including a room to be used as an industrial gas demonstration room, and which at present houses the gas-fired central heating boiler for the offices.

The main store forms a square enclosed by steel counters and wire meshing and is located centrally in the new building; normally stores will as far as possible be held in the steel storage bins provided.

The old showroom offices, which were none too well ventilated and depended largely upon artificial lighting, have also been rearranged in order to facilitate the modernization of the main showroom. The work of modernization includes (1) an up-to-date "live" hot water display where automatic gas-fired water boiling and heating appliances can be demonstrated; (2) more satisfactory storage accommodation for stationary and advertising material; (3) a suitable glassware stock room; (4) a small meeting room for conferences; and (5) a new system of ventilation ducting and fan to make possible the demonstration of modern gas fires under actual working conditions.

These extensions, and the modernization of the showrooms, having been carried out largely under war conditions, may not be altogether in line with the Corporation's original intentions, but it is considered that the improvements as effected are a milestone of progress in the history of the Gas Department.

In a contribution to this Association in 1936 I dealt fairly exhaustively with the distribution system of the Greenock Gas Undertaking and therefore do not consider it necessary to go over the same ground again, although it is worth recalling that I emphasized the increased sales per consumer which followed a progressive policy of regularly renewing and enlarging mains, service pipes, and meters.

Having outlined the reconstruction work at Inchgreen Gas-Works since his appointment as Gas Engineer and Manager to the Greenock Corporation in 1932, Mr. Keillor passed on to consider—

* Presented at the Spring Meeting in Greenock on April 8.

National and Regional Direction of Gas Affairs

Two of the principal national organizations serving the British Gas Industry are the National Gas Council and the British Commercial Gas Association. The former is mainly concerned with the provision of legal advice and the taking of legislative action and was formed in 1916; off-shoots from the National Gas Council are the Federation of Gas Employers and the National Joint Industrial Council, dealing with wages and conditions of service. The British Commercial Gas Association, on the other hand, is concerned mainly with the co-operative development of commercial efficiency and publicity. This Association has as an off-shoot the Industrial Gas Development Centre Scheme, which is separately supported financially.

These organizations have served the Gas Industry successfully for many years, and I shudder to think what sort of condition the Industry would be in at the present time had these organizations not been set up when they were.

The present emergency has emphasized the necessity of having national organizations to negotiate with the various Government Ministries on behalf of the 1,100 (or thereabouts) British gas undertakings. In view of the important functions and indispensable nature of these national organizations it must be ignorance of their real national value—I can think of no other reason—which causes the owners of gas undertakings to stand aloof, taking all the advantages of the organizations but giving little or nothing in return.

In Scotland the majority of gas undertakings are also members of the British Road Tar Association and the British Sulphate of Ammonia Federation, and, in addition, a larger number have joined the newly-formed Scottish Coke Association, which is affiliated to the National Federation of Gas Coke Associations. Here, again, we have found the necessity for a unified policy and for a representative national voice; unfortunately I must record that we have not got anything like 100% membership in Scotland. Those undertakings which are sheltering under the umbrella of the National Federation without expense or effort on their part should come in line with the majority and join the Scottish Coke Association without further delay.

Certain Government Departments have recently had occasion to discuss with representatives of the Gas Industry questions relating to the use of gas for industrial purposes, and it was found that the Industrial Gas Centres Scheme operating in the South provided the necessary liaison. North of the Tweed there is no Industrial Gas Centre, although tentative suggestions have been made from time to time that one be set up in Glasgow or Edinburgh. In the absence of a proper Industrial Centre the B.C.G.A. section of the National Gas Organizations in Scotland has for some years functioned as a "Bureau of Information." Such a Bureau can only be a temporary expedient; there is therefore urgent need for a properly established Industrial Gas Centre in Scotland. The interchange of data on the specialized industrial uses of gas is at the present time of great national importance, especially in industrial areas, and I feel sure that most gas undertakings in Scotland are awaiting the necessary lead which will enable them to become properly affiliated to the nine other Industrial Gas Centres in the South.

Whenever the necessary lead is given I sincerely trust that all gas engineers concerned will submit the proposals to their board of directors or corporations respectively at the first opportunity with a view to becoming contributors to the formation of the proposed Industrial Gas Centre. A central fund is required to enable the Scottish Centre to function on the same lines as the Centres already in operation, and there is no doubt in my mind that expenditure in this direction is in the national interest as well as in the interests of individual undertakings.

I consider that the main and supplementary objects of the existing national and regional organizations should be kept vividly before all members, and with this end in view I suggest that the Joint Co-Ordinating Committee should each year issue through the B.C.G.A. an up-to-date statement on the lines of the chart prepared by Mr. J. R. W. Alexander and myself; this chart appeared in The Institution of Gas Engineers' Transactions for 1934–35 on p. 705, and is invaluable when endeavouring to explain the functions of the various Associations to the uninitiated.

Another point that occurs to me is that much duplication of effort could be avoided if there was a Co-Ordinating Committee in Scotland. I feel that there is a pressing need for more wholehearted co-operation, especially in Scotland, in the directions indicated.

In appointing a Director-General of Gas Supply under authority of the Board of Trade it is apparent that the Government's intention is to strengthen the practical national direction of gas affairs. Whether future Governmental direction of gas affairs will take the form of gentle persuasion or positive regulation will depend upon the ability (or lack of ability) of the existing national and regional organizations to find satisfactory answers to the present-day and post-war problems which become more evident as the war progresses; for the most part these organizations would be capable of finding the answers and giving the necessary lead if the co-operation already pleaded for were an accomplished fact. It is a question of facing up to full co-operation and immediate action with the organizations at hand, even to the extent of exploring the possibilities of regional co-ordination of the manufacture and supply of gas, or waiting until we are told what we *must* do whether we like it or not.

Probable Future Developments

Assuming that the ranks of the Gas Industry are closed by 100% co-operation in the near future, the decks would then be cleared for action along the following lines:

The regional co-ordination of town and coke-oven gas undertakings to attain specific objects, such as:

(*a*) Conservation of coal by centralization of production where feasible.
(*b*) Closer co-operation of the coal industry.
(*c*) Increased production of suitable prepared solid fuels to replace coal presently burned raw.
(*d*) Improved efficiency in recovery of by-products.
(*e*) More economic direction of forward planning of all new works.
(*f*) Standardization of (1) pressures at which gas is distributed, (2) quality of gas, (3) gas charges, (4) service policy, and (5) gas burning equipment.
(*g*) Conservation of man-power by adopting mobile sections for work of an intermittent nature.
(*h*) Improved working conditions and conditions of employment.

It remains to be seen if the Gas Industry can overcome the many difficulties in the way of resolving some or all of these questions without special legislation. British railways and electricity supply undertakings have already shown us the way, and I have no doubt that regional co-ordination as a first step toward national co-ordination could secure some or all of the desirable objects itemized above, and would thus be to the everlasting benefit of the British Gas Industry.

Flint Gas Lighters

A patent (No. 542,890; application date, Nov. 4, 1940) relating to gas lighters of the type adapted to produce sparks by the interaction of a rotary abrasive member and a so-called flint has been taken out by Radiation Ltd., M. Howlett & Co., Ltd., and J. Dolphin. The object is to provide an improved lighter adapted to be mounted adjacent to a gas burner. The patentees state that hitherto difficulty has been experienced in ensuring immediate ignition of the gas issuing from the burner, repeated operation of the lighter being sometimes necessary before ignition occurs. It is claimed that by the invention this difficulty is overcome in a simple and convenient manner.

The invention comprises the combination with a part of the lighter actuating mechanism, of a hood which normally occupies an unobstructive position, and which is movable by the mechanism into a position adjacent to the burner and the path of the lighter sparks. The patent is especially intended for use on gas heated radiators of the kind comprising a long tubular burner, a radiating element adapted to be heated by the burner flames, and a reflector situated behind.

The lighter is mounted on the frame or body of the apparatus adjacent to the end of the burner tube which is remote from the end at which gas is admitted to the tube. The lighter mechanism comprises a spring-loaded spindle on one end of which is provided a finger piece. Also this spindle is provided with a diametrically arranged and spring-loaded pin through which motion can be imparted to a lever on a spring-loaded spindle carrying the abrasive disc or wheel. The flint is mounted in a holder adjacent to the wheel, and the wheel and flint are so disposed that when the wheel is rotated rapidly by the spring associated with the wheel spindle, the resulting sparks can pass through an opening in the frame or body of the apparatus into the region in which gas is issuing from the end of the burner adjacent to the lighter.

When the mechanism is in its initial or normal condition, the pin on the spindle of the finger piece abuts against one edge of the lever on the wheel spindle. On rotating the finger piece the pin imparts a corresponding rotary motion to the wheel spindle, both spindles in this action being moved against the resistance of their springs. Towards the end of the movement of the finger-piece spindle the pin passes under the lever and allows the wheel spindle to receive a rapid return rotation under the action of its spring, this rotation serving to cause the required sparks. On releasing the finger piece it returns under the action of the spring associated with its spindle, and in this movement the pin passes idly beneath the lever, until it reaches its original position where it again engages the lever.

Attached to the end of the finger-piece spindle remote from the finger piece is a sheet metal or other hood. This is so situated that normally it occupies an unobstructive position clear of the burner, but when the finger piece is actuated for bringing the lighter into action it swings the hood into position over the issuing gas. Preferably the edge of the hood remote from the lighter is bent inwardly so that it can be brought close to the surface of the burner and deflect the issuing gas towards the sparks. By means of the hood a partial enclosure is formed enabling the gas within the hood to be held momentarily while the sparks are passing from the lighter into the gas. After ignition has occurred and the finger piece has been released the latter returns to its initial position carrying the hood with it. The flame of the ignited gas then causes ignition of the gas issuing from the major part of the burner in the usual way.

Mobile Gas Producers

Models for Light and Heavy Vehicles

WARTIME contingencies brought producer gas very much into the news, and the further cuts in petrol allowances are intensifying the quest for alternative fuels. When a Midland town was heavily raided some months ago a factory was temporarily deprived of its normal town gas supply, but it was found possible to maintain a supply of some 25,000 cu.ft. per hour by means of modern standby gas producers. In another Midland area industrial developments necessitated a considerable bus service for the conveyance of workers to and from a remote works, and a fleet of vehicles fitted with trailer type producers, together with a margin of standby trailer units, was the solution. Recently ("JOURNAL," March 25, p. 430) the story was told of how a large transport undertaking had saved 136,000 gall. of petrol by running the entire bus services from two of its depots on producer gas, and the Chairman of the company was quoted as saying it was its intention to regard the use of producer gas not merely as a wartime expedient but as a permanent feature of the undertaking.

Petrol is likely to be scarce not only for the "duration" but for a time afterwards, and the work now being done on the conversion of motor transport from imported liquid fuel operation to the use of home produced fuels is therefore of great importance. The earliest wartime experiments were directed mainly towards the 50-cwt. type of commercial vehicle, but it was soon found that heavier traffic would have to be catered for. The first effects of petrol rationing brought the private car into the experimental range, but as the motoring world adapted itself to wartime conditions there was a dwindling of interest in this aspect of substitute fuels. To-day the whole range of road vehicles is affected by the urgent need for carrying on and the shrinkage in the supply of liquid fuel, and the man who uses his private car for business of national importance is as much concerned as the road haulage contractor.

Producer gas is not the only solution, nor has it yet attained anything like perfection. The Gas Industry is well aware of the possibilities of compressed gas in cylinders—possibilities that are now limited by circumstances beyond the control of the Industry—and is also providing a good deal of gas for the "gas bags."

Producers for private cars are now being made and fitted by the Enness Sentinel Gas Producer Company, capable of using anthracite or low-temperature coke, or a mixture of the two. The plant, built on the luggage grid of the car, consists of the producer or generator (comprising the fire-zone and fuel hopper), cyclone gas turbulator, gas cooling tubes, gas scrubber and filter, air mixing and gas control valves, and change-over control for petrol operation. Made in four sizes, the capacity of the plant ranges from 0.6 cwt. to 2 cwt. of low-temperature coke, or approximately twice the weight if anthracite is used. It is claimed, using the 2-cwt. plant, an ordinary car will run approximately 77 miles on one filling of coke, or 160 miles on anthracite, and that on private cars of from 10 to 15 h.p., the filters need cleaning every 500 miles when coke is used, and every 800 when anthracite is the fuel. Reactive fuels are recommended for short delivery work where much starting and stopping is called for. With such fuels it is possible to stop the engine and restart on gas after stops up to 1½ hours' duration.

The same Company also manufactures producers of the trailer type for heavier vehicles. It is worth noting that before deciding on the design of the scrubber unit the Company's engineers investigated no fewer than 48 types of scrubbing medium. Great importance is attached to the careful storage of fuel for all types of producers. Larger users are usually well aware of this precaution, but the makers find it necessary to impress upon the new private user the necessity for storing the fuel in a clean and dry atmosphere.

Apart from developments in connexion with road transport the Company is doing much useful work on the industrial side, and its 10-therm industrial producer is, we understand, in widespread operation. It is a self-contained unit which can either be mounted on a bogie enabling it to be easily transported from one part of a factory to another, or the generator and cooler tower can be demounted and erected in any suitable position without difficulty. The only connexions necessary are those to water and electricity supplies, together with the piping from the cooler filter to the plant to be operated. If a gas booster is installed in connexion with the existing town gas system the producer gas may be delivered into the existing gas mains, provided that adequate precautions are taken to ensure that the valves are operated so as to make it impossible for both valves to be operated at the same time. It is stated that gas-works coke (1 in. boiler nuts) and any size of anthracite from ⅜ in. to 1¾ in. can be used, but low ash and tar content is essential. The average output of the set is 6,000 cu.ft. per hour. Using anthracite as a fuel an output of 10 therms is obtainable, and with ordinary gas-works coke, 9 therms.

The 10-therm producer is already in widespread operation for heating production furnaces, such as salt baths, die heaters, heat treatment ovens, &c., running-in of test engines, and for heating of offices and works and firing of cooking apparatus in works canteens.

Comfort as a Wartime Economy

By "OMEGA."

THERE is a type of mind, all too common, which believes that the only way to economy lies in retrenchment, in cutting down, and in what might be termed negative methods. The man with this kind of outlook imagines he can cut his costs by underpaying his workers or by buying so-called "cheap" equipment. Such a man is letting the ship go to ruin for the want of a ha'porth of tar.

The necessity for drastic economy in all directions has been brought conspicuously to the fore by the impact of war, and it is instructive to look around and see how our different neighbours are dealing with the problem. Broadly speaking, there are two classes of people: those who regard money and other assets as something which is being used up, and therefore must be hoarded, and consumed as slowly as possible. These I call the negative economists (actually they are not economists at all). The other class, or positive economists, regard these assets much as a farmer regards his seed grain—as something which has within it the potentialities for increase and development.

Those of the first class fly at once to cutting down everything, oblivious to its effect on output.

The man in the second class pauses to think. He is not so much concerned with cutting down as with improving the efficiency of what he has got.

It is characteristic of the negative type of mind that it ignores one great fundamental factor—that man-power is often more vital than money or raw material. And by man-power one means not only physical labour, but all such help as can be derived from clear thinking. It is not brute force which is going to win this war, or which has won any great fight. The war will be won by those who can keep their faculties free from physical and mental squalor.

In this war we all know only too well that most of the amenities of civilization and much of the raw material of manufacture *must* be cut down. The stuff simply isn't available. But there is no need to go hysterical about it.

The object of this article is to focus attention on one aspect of all this—the place which personal comfort takes in the scheme of things. Comfort is not, up to a certain measure, a luxury. It is a necessity. It is as necessary to the efficiency of a business as oil is to the running of a machine. The baker's roundsman who drives a horse-drawn van fitted with rubber types can deliver more bread in an hour than he could when he had to rattle along in a steel-tyred vehicle. And it may easily be that four such men could do the work of five who were not so well equipped. Moreover, their added comfort reflects itself in their dealings with the customer and in their firm's service.

So, when I walk through a retort house and see men trying to attend to producers or to load coke skips in a dark cellar I cannot but think that the craze for saving light has somehow run amok, that if, say, the walls were kept whitewashed and the lighting equipment put into good order and a little more dust were swept away, the little extra labour (even if it had to be "overtime" labour) would be amply repaid in results, and the small amount of extra gas needed for the lights would be saved a hundredfold by increased gas made from the retorts.

When I see the technical assistant, covered in sweat and grime, taking the temperatures of flues in the attitude of a contortionist, when the provision of a light staging or platform would enable him to carry out this routine job in comfort, I feel sure that, even in wartime, or perhaps more truly in wartime than in peacetime, a little sane expenditure would be more than justified. There is no more inefficient worker than the one with a grouse, and even those conscientious workers who say "there's a war on" and don't grouse, are not giving of their best if they are working with a subconscious feeling of continual frustration, brought about by trivial annoyances.

It behoves all of us, therefore, in these difficult times when the tempers of most of us are apt to be a little frayed, to be wary when we are thinking of cutting down.

To take what may seem a very minor matter—cleanliness: This may easily be thought to be of secondary importance, yet it is an essential item of necessary comfort. Few workmen will go out of their way to oil a bearing which is buried in a pile of greasy coal dust. Slovenly appearance of plant invariably leads to slovenly attention to it, and breeds an attitude of mind in some men which makes them regard trouble and bad work as unavoidable, so that they look upon any extra attention as so much time wasted.

The moral of all this is that, in our search for means of saving the pence, let us beware of losing the pounds through taking too short and too narrow a view.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

AUSTRALIAN GAS INDUSTRY IN WARTIME*

By A. E. HUTCHISON,
Controller of Gas Sales, Australian Gas Light Company, Sydney

IN the war effort the Gas Industry is rendering a definite and effective service, not only in the supply of its main commodity for war industries and for the commercial and domestic requirements of the people, but in the supply of its by-products for use in the production of the munitions of war. Indeed, it is not too much to say that war has proved beyond all doubt that the Gas Industry is performing an essential national service. Wherever heat is required in industry—and in the production of the requirements of war various types of heating equipment are brought into use—gas is doing the job. We have developed large salt bath furnaces, pusher type forging and hardening furnaces for mass production of ferrous and non-ferrous parts, air recirculation furnaces, billet heating furnaces, controlled atmosphere furnaces, and forging, rivet heating, and heat treating equipment. Special equipment has been designed for factory heating, and extensive hot water and canteen installations have been provided for factories employing large numbers of war workers. One of the larger companies has a well equipped annexe producing Bren gun carriers and other important war materials.

Many operations connected with the production of war equipment have called for great accuracy in the control of temperatures and atmospheres. Much experimental work was necessary in both the Sydney and the Melbourne laboratories to secure satisfactory results with these furnaces, and the results which have been achieved have proved of remarkable value, with not a little wonderment to mechanical engineers outside the Gas Industry. All this has demonstrated the great potentialities of gas as an industrial fuel, and must ultimately prove of great importance in the further development of the industrial load.

New Problems

War brings many problems, apart from war itself. The changes in our economic structure involved in the transfer of our social and business lives from a peacetime basis to a wartime basis are of necessity drastic. War creates problems of finance and organization undreamed of in normal times; things which were regarded as impossible in a peace economy are done without question in time of war. Everything is subordinated to the requirements of war. There is no other way to win a total war.

It is inevitable therefore that business must adjust itself to abnormal conditions, that costs will rise, and supplies for the ordinary requirements of the community will diminish. The Gas Industry is affected by these conditions in many ways. New employment problems arise, and new and perhaps temporary demands for gas and by-products are created; the costs of coal and other materials continue to increase and there are increasing difficulties in securing supplies; labour costs go up, and there is apparently no limit to demands for improvements in wages and conditions of employment. In Sydney, notwithstanding all this, the price of gas remains stationary, and so far all the demands of supply have been met.

Compared with the conditions governing price regulation in other industries, there is no justice in the action of Governments in withholding the price adjustment proved by the Australian Gas Light Company to be necessary. As a gas salesman I would be the last to welcome an increase in the price of gas unless, in addition to meeting the legitimate requirements of shareholders, it provided us with the wherewithal to promote the prosperity of our business and so help ultimately to restore the price. Existing circumstances, however, have forced the Company to restrict its promotional efforts and to curtail its service to the customer. The effect of this must be to influence adversely the retention and development of the gas load.

Industrial disturbances in industry generally—and particularly in industries directly concerned with the war effort—can only be described under existing conditions as tragic. It seems almost unbelievable that while our soldiers abroad are sacrificing all the comforts of life, and maybe life itself, their fellow workers at home are being paid on a much higher scale than they are, and are demanding more. And disputes are not confined to wages questions only; a disagreement with a foreman because of some alleged action of his in regard to an individual workman will be sufficient to stop operations throughout a factory, whether or not it affects the war effort. All this can be traced to a shortage of labour because of the greater demands on industry, and because of the absence of men on military service. There is a strong suggestion in this of wartime profiteering comparable with that of the unscrupulous capitalist who makes huge profits out of war work—if he is allowed to do it. Unfortunately—so far as the war loading of 6s. per week is concerned—it had its origin in government interference in industrial disputes. To settle a dispute regarding wages for men engaged on work connected with the war a Minister in a previous Federal Government—being concerned only with keeping the work going—gave the men an extra 6s. per week and called it a special rate because their work was connected with the national war effort. This decision contained all the elements of a dangerous precedent, and the extra rate soon found many claimants. Union leaders, skilled in the art of framing claims, had little difficulty in supplying reasons for demanding the application of the war loading to their members, however indirect or remote the relation of their work to the war effort might be.

Another major difficulty at the present time is that of supplies of appliances and material for their installation, particularly where the use of non-ferrous metals is involved. We must regard this as inevitable under existing conditions, in view of the demands of war, and the problem arises of finding suitable substitutes if we are to continue to supply the requirements of customers. Perhaps in some instances it would be better to allow an appliance to go off the market for the time being rather than to use an unsatisfactory substitute, but in any case it seems clear that the number of types of appliances on the market will have to be reduced to a minimum. In this regard some permanent good might result, for, as has often been pointed out, the gas business suffers from a surfeit of variety in its appliances.

The shortage of galvanized piping for installation of services presents problems for both the present and the future. Substitutes must be used, and, from these, difficulties from corrosion are bound to arise in the course of time. The supply of copper tubing for hot water installations is severely restricted. Perhaps it is fortunate that our sales of these services—for various reasons arising from war-time conditions—are not so heavy as they would be if we went out after business, for it is of no avail to sell appliances if we cannot install them. In regard to new buildings, however, some method of meeting the position will have to be found if supplies of copper tubing cease or diminish further; as a wartime emergency measure temporary expedients will have to be used until copper tubing is available. In the fitting-up of bathrooms in new homes, for example, the temporary running of substitute piping along walls may have to be resorted to, or the temporary fitting of substitute piping under substitute tiling. This, of course, would require the co-operation of architects and builders, as well as owners, but, as I mentioned previously, we do things in wartime which we would not entertain in peacetime, and so we must expect that all parties will approach these questions in a reasonable spirit.

Load Building

In the promotion of gas sales—especially along new avenues of use—any increase in the load is worth having as long as it is not definitely and permanently unprofitable. In fixing a rate we must naturally be guided by costs, but we must also have regard to the customer's value of the service to him—in other words "what the load will bear"—as well as to the present and ultimate value of the business in the all-important consideration of the retention and development of the gas load. New business with a good load factor is much to be desired, and diversity of use makes for bigger and better business. Increased output and improved load factor come from greater use, and it is on this principle that electricity supply authorities are using every endeavour to induce the public to adopt new methods and do their work "by electricity," offering tariff rates which would appear to be below the cost of the production of the electricity used. The realization by electricity supply authorities that they can cheapen their costs of production by advocating diverse uses of their product is one of the most important factors in the development of the use of electricity.

When the Sydney County Council spent £30,000 in order to get 5,000 electric cooking ranges installed, the wisdom of it was questioned by technicians inside and outside the electrical business. It was wondered just how far the Council could go building up a secondary load at a price apparently below cost; sooner or later, if their efforts met with the success they looked for, they would be faced with increased capital expenditure with no prospect of an adequate return. Well, the electricity supply authorities are still using every endeavour to sell appliances to encourage diversity of use of electricity, and the Gas Industry is doing its best to stop them and to influence the public to use gas. True there are differences in the distribution problems of the two services, in that one can be stored to meet off-peak loads and the other cannot, but when we get right down to facts the natural and business-like thing to do is to secure the load wherever it is practicable; the increase of business which goes with the successful development of the load will cause many theoretical difficulties to disappear.

Regarding load development, under existing conditions, of course, there may not be very much we can do about it, but that should not prevent our applying our minds to it. The future is too uncertain to enable us to forecast with any feeling of security just what course our political and social lives are likely to follow. Whatever the result of the war, great changes are inevitable; this much is certain: that unless we emerge victorious the "new order" will make life hard for all of us.

But let us assume that life will still be worth living, and that the community will set about adjusting itself to peacetime conditions as rapidly and effectively as circumstances will allow. In the interregnum

* From the Author's Presidential Address to the Australian Gas Institute, November, 1941.

between the termination of the war and the resumption of normal living—or as near to it as we are able to get—there is bound to be unemployment. Thousands of people who have been engaged in the production of the munitions of war will probably cease that work automatically. The men in the fighting forces and others on military duty will return to their civil occupations, displacing those who have filled them temporarily. There may be an influx of new population, and problems arising from this will need the careful attention of our Governments.

As a consequence of the losses and chaos arising from the war, it seems inevitable that the standard of living will be lower for all, but the great mass of the people who live on wages will strive to maintain their economic position by demanding a greater share of the national wealth, and a constantly higher standard of living.

We must be prepared for greater control of industry by government; financial interests, commerce and industry, and people in employment will continue to pay heavy taxation to provide for those out of employment, and for the repatriation of soldiers; and the worker will demand a greater share of the amenities of life.

The Gas Industry, as a public utility, will have an important part to play in re-establishing the life of the community. Together with other public utilities it will have a national duty to perform in providing employment which will supply a definite service to the community. A progressive outlook will be necessary to retain and develop the gas load, and we shall be called upon as never before to provide our essential service as efficiently as it is possible. This will demand an overhaul of our public and customer relations, so that we shall be able to build up prestige and gain the goodwill of all sections of the community. In this work there is an urgent demand for leadership in the Industry. Inspiration must come from those in high places, and organized effort will be necessary to obtain the enthusiastic co-operation and support of all ranks in the Industry. Educational propaganda, with a sound basis of service, must be freely and effectively used. A Magazine of Gas News, with a wide distribution covering all employees of gas companies contacting the public, also architects, builders, gas appliance manufacturers, and merchants, as well as a carefully compiled list of gas customers, will help considerably in this, but special propaganda on specific subjects will be required from time to time, and wherever the need is urgent.

The question of price structure must be taken up as a national problem, with some attempt to secure uniformity in practice as far as it is possible. While doubtless the different forms of legislation operating in the various States may prove obstacles to uniformity, some definite plan can at least be laid down and followed wherever possible. Here, again, well directed propaganda may in time remove all obstacles to progress.

In the matter of customer relations, it is imperative that every employee whose duties bring him in daily contact with customers shall be imbued with the spirit of service, realizing that in his work he is playing a definite part in retaining and developing the gas load. All these employees should be brought directly under the influence of the gas sales organization—indeed they should form integral parts of it—for they need the enthusiasm and inspiration of selling to give them the right atmosphere in their work.

INSTITUTION RESEARCH REPORTS DISCUSSED

Gas Research Board Communication No. 5

(*Concluded from p. 62*)

Insulate the Fire Back!

Mr. **H. J. Hodsman** (Leeds University) wrote: I share the Authors' plea for attention to the design and construction of fire backs. Too often, as in this case, common everyday needs receive too little attention from the scientific technician. The need for ample heat insulation was emphasized by Dr. Pridgin Teale, the pioneer in fire-grate reform, over sixty years ago. Attention to this feature and not those claimed by Teale may well have been a major reason why his grates set the fashion for the so-called "modern" barless grate. When, in 1925, with the help of Mrs. M. F. Bligh, I began to make comparative measurements of efficiency and performance of solid fuels in open grates, the first thing we observed was the great importance of insulating the fire back.* It increased the efficiency of radiation by 50%.

I have, however, long doubted the wisdom of giving fireplace backs the complicated and fragile constructions which are current instead of using simple standard shapes made, when possible, of insulating material. In this connexion I have pleaded for a standard fire grate—not necessarily of commercial pattern—for use when making grate tests of fuels; the feasibility of this was shown by constructing such an appliance, but circumstances have prevented the matter being pursued further.

There is another method of studying this use of heat insulation—namely, to measure the radiation of heat both from the front and from the back of the fire with and without insulation. Mrs. Bligh was able to note, if not measure, how considerable was the radiation efficiency of an uninsulated fire back.

Dr. **A. L. Roberts** (Leeds University) wrote: I think that the detailed study of the domestic fire back now being undertaken by Mr. Green and his colleagues will prove valuable in many directions. It is surprising that so little attention has hitherto been paid to an appliance which, however humble it may seem, is in universal use and the medium for the consumption of some 30 mill. tons of fuel annually.

Accurate information as to the proportion of heat lost by conduction through the usual fire back is not available, but it is probably considerable; to judge from published figures for the radiant efficiency and flue losses of test fires, it may be of the order of 10 to 15% of the total heat in the fuel. Perhaps the most striking demonstration of the results of reducing the conduction loss was afforded by the work carried out at Leeds in 1925 by Mrs. M. F. Bligh and H. J. Hodsman.† It was then shown that the application of insulation (firebrick and slag wool) to the fire back of their experimental open firegrate resulted in a pronounced gain in radiant efficiency of a coke fire (*e.g.*, from 15.7 to 23.7%). Consequent additional advantages were that noticeably less fuel was required to maintain the same conditions, and the combustion of the fuel was more efficient. It was pointed out that insulating the fire back enabled a good fire to be obtained with a low-grade coke which was otherwise scarcely satisfactory.

There can be little doubt, therefore, as is borne out by the values of the heat flow through the fire back given in the present Report, that proper choice of fire-back material results in an appreciable saving of fuel, and is possibly the only way in which such savings may be achieved with the present design of grate. The point is obviously of considerable importance, especially under present-day conditions when rigid economy of domestic as well as industrial fuel is called for.

The temperature-gradient data have already given useful information with regard to the conditions in the fire back which tend to cause cracking by thermal shock. Such troubles will probably be accentuated if light-weight firebrick is used for the fire back, because of the relative fragility of this material and the higher temperature gradients to which it might be subjected, unless sufficiently thick or lagged. I would like to suggest that the fire back proper might advantageously be made from a "semi-insulating" material which represents a compromise between low thermal conductivity and high mechanical strength, and then lagged with a material of low conductivity, such as diatomite brick. I might perhaps mention that some two years ago I replaced the dense fire back of one of the coke fire grates in my home by porous fireclay brick of this type (conductivity at 500°C. mean temperature, approximately 2.5 B.Th.U./ft.²/hr./in./°F., and cold crushing strength of *c.* 600 lb./in.²), and 3 in. thick; the radiation from the fire was noticeably improved by this alteration, and these bricks have proved surprisingly durable, cracking and erosion being negligible so far.

I feel that additional valuable information about the behaviour of the fire, and the effect of different types of material or design of the fire back, would be obtained by making direct measurements of the radiant efficiency both at the front of the fire and behind the fire back, in addition to determining the temperature gradients.

The appreciable reduction both in "pull-through" time and the time required to produce a useful fire favour the adoption of light-weight firebrick material, preferably lagged. The curves in fig. 8, however, show that with this arrangement the temperature drop on refuelling is considerable, and might appreciably increase the already pronounced cooling which occurs when fresh fuel is added, and which I think is one of the objectionable features of the coke fire. From this point of view the insulated back of standard firebrick, which showed the least drop in temperature, might be preferable. The question seems to be to what extent the behaviour of the fire is dependent on the temperature, and the changes in temperature, of the fire back, and the suggested measurements of radiation efficiency might provide an answer. I am sure this work will be appreciated, and its continuation watched with interest, not only by the manufacturers of fire backs, but by all those who hope to see the smokeless fuel fire achieve greater popularity.

I was especially interested to read of the work begun on the behaviour of refractory materials in torsion and under compression at high temperatures. I have long been of the opinion* that a fundamental study of high-temperature flow and, if possible, the establishment of its laws, would give results of prime importance and permanent value, because the behaviour of refractory materials at high temperatures, whether during manufacture or in service, depends largely on their viscous and elastico-viscous properties. I have made a number of torsion experiments similar to those described in this Report, but on materials of the fireclay type; generally the results obtained were in close accordance with those of Mr. Green and his colleagues and, like their own, did not conform with the expression for the suggested type of triple deformation. In my opinion this was probably due more to some constitutional change in the material under the influence of high temperature and stress (*e.g.*, the "shear hardening" mentioned in the Report) than to the temperature gradient along the test-specimen; firstly, because the rate of "flow" increases

* *J.S.C.I.*, 1927, **46**, 92T.
† *J.S.C.I.*, 1927, **46**, 92T.

* *Trans. Ceram. Soc.*, 1937, **36**, 326.

rapidly with temperature, so that most of the deflection measured probably takes place over that portion—even though it may be small compared with the total length—of the test-piece which is at the maximum temperature; secondly, because the same departure from the theoretical expression is reported as having been found in the compression tests, yet in this case the temperature distribution in test-piece presumably approached uniformity. The concept of "shear hardening" is certainly important and worth investigating fully.

With regard to points of experimental detail, the non-uniform temperature distribution in the test-piece is admittedly a serious difficulty in high temperature torsion testing, but it can be minimized by using the special type of test-piece devised expressly for this purpose which is described by Professor Cobb and by myself. An alternative method which enables simple test-pieces of uniform section still to be used is that of "differential" deflection measurement; in the present case the indicating "arms" in this device might be made, say, of platinum, and could probably be carried well into the furnace so that the deflection measured was that taking place in a short central length of the test-piece and over which the temperature was reasonably uniform. An additional advantage of this method is that errors of deflection measurement due to movement of the test-piece in the chucks are eliminated.

I might mention that the method of applying torsional stress by means of a counterpoised lever and weights may lead to inaccuracy when the angles of deformation become large, owing to the displacement of the effective points of application of the weight and counterpoise. This is a second-order effect normally, but may become appreciable for large angular deflections, when the method of applying the torsional stress by a weight and pulley is preferable.

Reply by Mr. Green

Mr. **A. T. Green,** in reply, wrote: We are grateful for the appreciative contributions to the discussion by Professor Cobb, Mr. West, Mr. Hodsman, and Dr. Roberts. The suggestions made will be carefully considered in planning the development of experimental work on high-temperature deformation and firebricks. We are very interested to learn that in the experiments of Dr. Roberts on the behaviour of fireclay under torsion, the observations did not conform with the usual conceptions of elastic viscous and elastico-viscous deformation. Further experiments, also with porcelain, have tended to lead us in the same direction as Dr. Roberts—namely, that constitutional changes in the material intervene.

TOWN GAS AND KINEMATIC VISCOSITY

Discussion on Mr. Arthur Coe's Paper, an abstract of which appeared in the March 18, 25, and April 8 issues of the "JOURNAL."

(*Concluded from p. 69*)

Mr. **S. G. Melville** (Edinburgh) said that if Mr. Coe's conclusions were correct, why was it that no one had tackled the subject before? Was kinematic viscosity just another name for a group of properties they already knew? How were they to measure kinematic viscosity? What were the main items on which kinematic viscosity depended?

Mr. **J. R. Denoon** (Edinburgh) said that up to the present time the coal, electrical, and gas industries had developed along entirely separate lines, and had more or less been competing in the supply of fuel to the public. From an economic standpoint it would seem possible for these industries to be nationally combined in the following way: The coal output of the pits could be carbonized in either coke ovens or retorts and the residual coke utilized for the production of electrical energy by the power stations. As a result industrial and domestic consumers would be deprived of coal but would have smokeless fuel (possibly from low-temperature plants), electricity, and gas at a low price. The smoke abatement problem would then be automatically solved. With reference to Mr. Coe's proposition for a standard *kv* by the control of inerts he would be interested to know how this control would be carried out in the various types of carbonizing plant at present used by the Industry. It would seem that some works might have to increase the inert content and others to attempt to reduce the high inert content resulting from their particular carbonizing practice. How would Mr. Coe propose to deal with this problem?

Mr. **Wm. Masterton** (Edinburgh) said that as long as the Gas Industry manufactured coke it contributed to sulphuric acid pollution of the atmosphere unless, of course, it confined coke sales to electricity undertakings, or large industrial users practising electrostatic precipitation of sulphuric acid from the waste gases. The problem before them was to find the correct method of treating coal, and if standardization of appliances and of gas quality came into being before they have solved this, then they would have millions of standardized appliances. When the correct gasification process was ultimately found, if it produced gas of a different quality from the official standard they would be faced with the dilemma of having to scrap all these appliances or to be content to do without the correct process.

Mr. **E. G. Smith** (Dumbarton) said that streamline flow continued to a certain point, then there was a definite change in the curve. Might it not be the point where viscous drag interfered with streamline flow and turbulent flow was set up?

Mr. **K. Graham** (Glasgow) said that it was very difficult to think in terms of kinematic viscosity. Apparently CV had not much to do with it, and he would like to know what adjustments would have to be made at the works to control kinematic viscosity. It would appear that a gas could be made with a constant kinematic viscosity yet having a varying calorific value.

Mr. **Coe,** replying, said there were several reasons why kinematic viscosity had not been investigated before. The principal one was that the study of the bunsen burner had never been previously approached in terms of flow. The burning of gases has been investigated at great length by chemists, and the speed of flames also. The work under view postulated: (1) That from the chemical angle it was sufficient to know that the mass of gases reaching the flame front was balanced by precisely the same mass of gases leaving the flame front. (2) That from the flame speed angle, it was sufficient to know that the inner cone took up a position in the pressure gradient through the flow system such that (1) was satisfied. (3) That all the physical effects of the chemical change were balanced by changes in the area of the inner cone, and that since a mass of gas which was free to expand could not increase in density when heated, the inner cone was not a zone of pressure which determined the stability of the bunsen flame. It was merely an indication of the distribution of velocities across the stream, and of the relative intensity of the combustion which was occurring at this point.

Was *kv* an old property with a new name? No. The relationship between the coefficient of diffusion and of conductivity and kinematic viscosity was first established by J. Clerk Maxwell. There had been discussion as to whether absolute viscosity or kinematic viscosity was the more fundamental. Kinematic viscosity had come into practical use by the use of Reynolds' criterion in flow problems. He was not aware that this property had ever been considered in connexion with combustion phenomena.

How could it be measured? By the change in the mass rate of flow of a mixture of gases when all other conditions affecting flow were maintained constant.

How could it be controlled? Given a standard *kv* as the basis for the design of burners there would be a permissible range of variations on any works, but whether this range would be the same for all mixtures of gases was a matter to be determined by experiment. The range was determined by the criteria of flash-back and blow-off. A standard burner would be required to determine these limits, and if these were the same for all mixtures of gases the standard burner would be merely a check. If these limits varied, then periodic tests would be necessary with the standard burner, as the first step to operating within the range control would then turn upon the mixing of different gases, such as horizontal gas and C.W.G. or even by the specific use of inerts. The choice of standard would obviously have to take account of this procedure. The main point here was that the procedure would be essentially the same whether these limits were calculable or not, and whether they were the same throughout the country or not.

What were the main items on which kinematic viscosity depended? The absolute viscosity and the density of the gas. These clearly depended upon its composition, but as it was not possible accurately to calculate the viscosity of any mixture of gases, the question of the effect of different constituents on viscosity would have to be determined by experiment. It was not, however, necessary in practice to know this if the limits of flash-back and blow-off could be readily determined, as indeed they could be.

In reply to Mr. Masterton, the clearing of the atmosphere should undoubtedly be one of the main points in the future policy of the Industry. The first step here was to provide facilities (all-in grates) which would enable smokeless fuel to be more widely used. The choice of "the correct gasification process" was surely limited by the design of the burners which already existed by the million. His point was that the standardization of burner design on one kinematic viscosity would give the maximum possible range of choice in this matter, and it would take away the great barrier to progressive choice of "the correct gasification process" which was presented by not knowing in advance how a particular gas would behave when it reached the districts.

In the national planning of fuel supplies along these lines the first requirement was universal facility to use smokeless fuels (a standard grate or its equivalent), just as in gas supplies they needed a standard burner or its equivalent. The addition of nitrogen (or air) would reduce the kinematic viscosity of the gas. The standard kinematic viscosity would therefore need to be one achieved by some dilution with inerts beyond the normal for the best practice.

Calorific value was a distinct property, and he had dealt with the control aspect. The starting-point for standardization was the burner used by the consumer. The control of kinematic viscosity was a very small matter compared with that of providing burners suitable for a gas with a very different structure in every town and village throughout the country.

Gas Products Prices

The London Market April 13.

There is very little movement in the prices of Coal Tar Products, as many of the usual markets are no longer available and pitch/creosote mixture as a fuel oil has taken their place.

Pitch is still a nominal market, but for such quantities as are being sold the price ranges between about 45s. and 50s. per ton. Creosote is about 5d. to 6d. per gallon. With regard to refined tar the price for next season has not yet been definitely fixed and it is expected that this will come under a Direction to be issued by the Coal Tar Controller. Pure toluole remains 2s. 5d. per gallon under the Ministry of Supply Toluene No. 2 Order. Pure benzole is about 1s. 10d., 95/160 solvent naphtha is 2s. 5d. to 2s. 9d. and 90/160 pyridine remains about 13s. 6d. per gallon. All the above prices are *ex* Makers' Works. Naphthalene prices are unchanged and are in accordance with the Control of Tar Order 1941. The Order refers to maximum prices, and the figure for refined crystal naphthalene in 2-cwt. bags and 4-ton lots is £23 per ton delivered.

The Provinces April 13.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 1s. 10d. (controlled by the Control of Toluene No. 2 Order, July 5, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 11d. to 1s. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 9d. to 1s. 10d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4⅝d.; Scotland, 4½d. to 4⅝d.; low gravity, 4½d. to 4⅝d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 7½d. to 3s. 9d. Naphthalene, £15 to £20. Salts, drained, £6 to £6 10s.; whizzed 72°, £7 15s.; 78°, £9 5s. Anthracene prices fixed by Controller. Heavy oil: Unfiltered anthracene oil (min. gr. 1,080), 6d. to 6½d.; filtered heavy oil (min. gr. 1,080), 6½d. to 7d.; heavy anthracene oil gr. less than 1,080, 5⅜d. to 6d.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 o the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland April 11.

Prices showed no alteration. Refined tar 5d. to 5½d. home and 5d. to 5½d. per gallon export. Creosote oil: Specification oil, 6d. to 6½d.; low gravity, 7d. to 7½d.; neutral oil, 6½d. to 6⅝d. per gallon; all *ex* Works in bulk. Cresylic acid is not plentiful and prices continue strong. Pale 99/100%, 5s. to 5s. 6d.; Pale 97/99%, 4s. 6d. to 5s.; Dark, 97/99%, 4s. 3d. to 4s. 6d. per gallon; all *ex* Works in buyers' packages. Crude naphtha, 6½d. to 7d. Solvent naphtha: 90/160 grade 2s. to 2s. 3d. and 90/190 Heavy Naphtha, 1s. 9d. to 2s. per gallon. Pyridines: 90/160 grade 13s. and 90/140 grade 15s. per gallon.

Gas Stocks and Shares

Business in the Gas Market was a little brighter last week and prices were well maintained. The few changes were all in an upward direction, a feature being the sharp rise of 7 points in South Suburban 3¾% preference stock and business was recorded at the top price of 92. There were several other instances of high-priced transactions though, in these cases, the quotations remained unchanged. It will also be noticed that Newcastle units have reached par. The Directors of the Oriental Gas Company have declared an interim dividend of 3½%, the rate paid for many years past. Current events have led to some depreciation in the market value of the Company's stock, which now stands at par, but the undertaking is in a particularly strong financial position, and well able to withstand a long period of adverse circumstances should affairs in India become more difficult.

The following quotations were changed during the week:

OFFICIAL LIST

Montevideo Ord.	69—74	+4
South Suburban 4 p.c. Pref.	73—78	+3
Ditto 3¾ p.c. Red. Pref.	87—92	+7
Wandsworth Ord.	77—82	+1

SUPPLEMENTARY LIST

Tunbridge Wells (x.d.)	95—100	April 7

PROVINCIAL EXCHANGES

Hartlepool Ord.	64—66	+3
Liverpool Ord.	104½—105¾	+1
Newcastle Units	19/9—20/3	+-/6d.
Ditto 4 p.c. Pref.	86½—87½	+1½
Ditto 3½ p.c. Deb.	86½—87½	+3½
Weston-Super-Mare 7½ p.c. Deb.	140—145	+5

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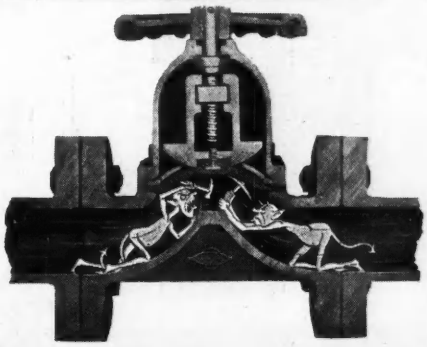

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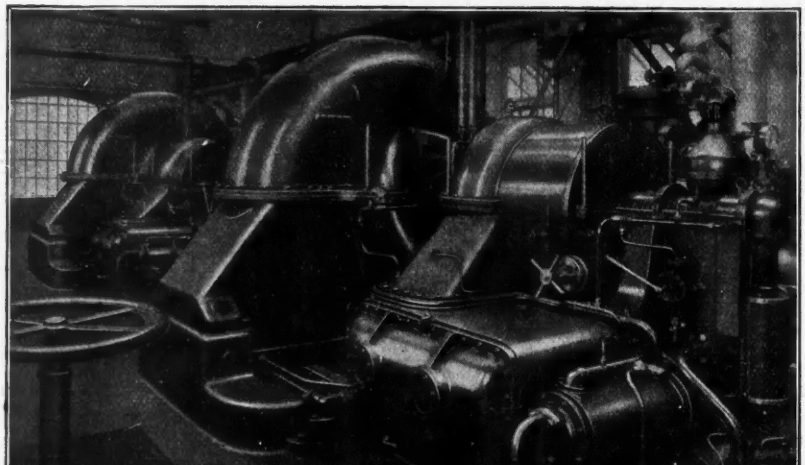

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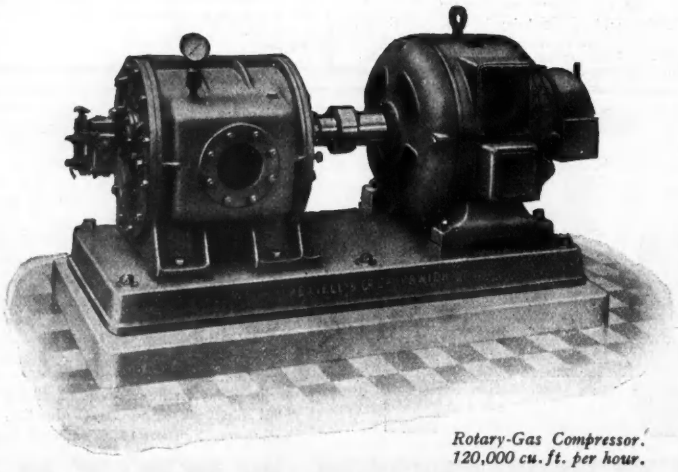

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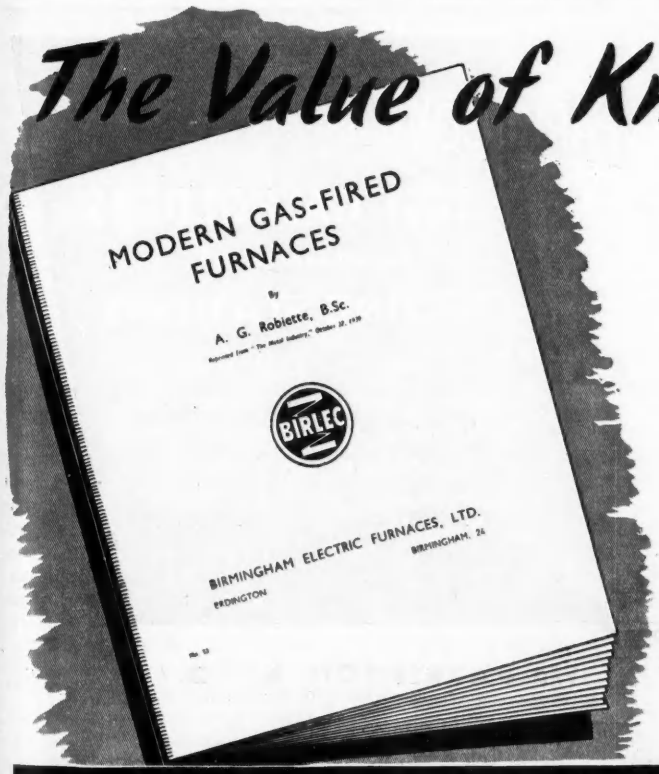

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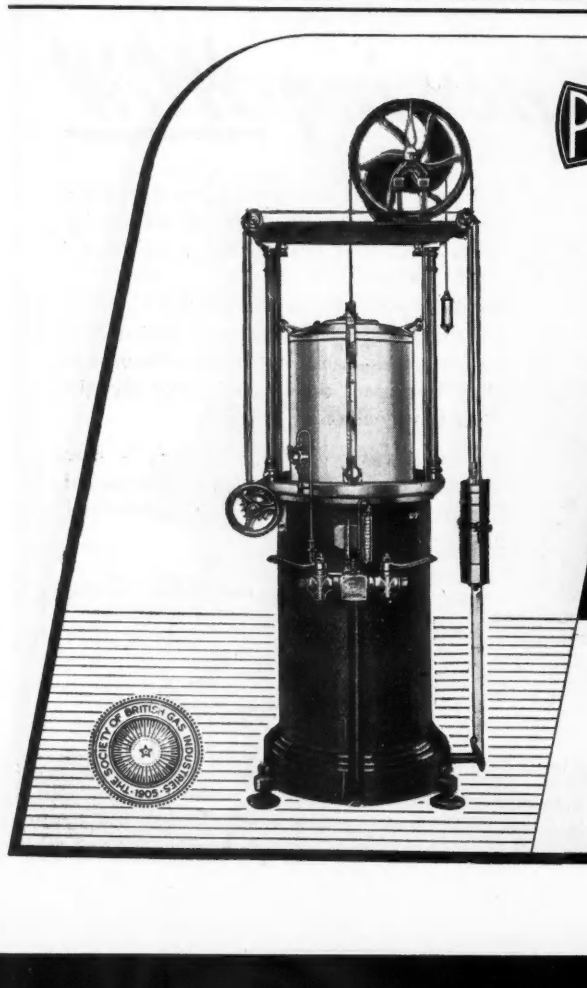

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